REMARKS

This amendment is responsive to the Office Action dated September 22, 2004. Applicant has canceled claims 2 and 3, amended claims 1, 4-6, 13, 14, 17-19, 22 and 37, and added claims 39-44. Claims 1, 4-44 are pending upon entry of this amendment.

Claim Objections

The Examiner objected to claim 17 as having a typographical error. Applicant has amended claim 17 to correct the error.

The Examiner objected to claim 37 requesting that "a table" should be corrected to "a database table" for clarity. Applicant submits that the term table as used in claim 37 and throughout the specification is not necessarily referring to a database table. Applicant has amended claims 37 to recite "a routing table." As described in the present application, the routing table may various forms, including a flat file or a database. See, for example, page 8, ll. 21-24 or the present application.

Claim Rejection Under 35 U.S.C. § 101

In the Office Action, the Examiner rejected claims 18-22 under 35 U.S.C. 101 asserting that the claimed inventions are directed to non-statutory subject matter. Applicant has amended claim 18 to recite elements that defines structural and functional interrelationships which permit the data structure's functionality to be realized. For example, claim 18 as amended requires the first data structure and the second data structure to be stored within a routing table and associated in a manner that causes a network router to output a routing communication to withdraw one or more routes and specify the failed link identified within the first data structure and without resending the routing communication.

Support for this amendment can be found throughout the present application. Applicant refers the Examiner to page 6, ll. 6-14 of the present application that illustrates example embodiments of routers that having routing tables storing link failure information as claimed:

> *Each of routers 4A-4D may communicate their link failure information to neighboring routers in several different ways. In one configuration, each of routers 4A-4D embed the link failure information within the conventional update messages, such as*

BGP UPDATE messages, to identify the particular network links that have failed. In another configuration, each of routers 4 are configured to send a separate link failure message describing the failed link. In either case, each of routers 4A-4D analyze prospective routes based on the link failure information to determine whether they include failed links and revise their routing tables based on the analysis. By using the revised routing tables, routers 4A-4D reduce the likelihood of transmitting packets along paths that include failed links.

As the Examiner correctly acknowledges, the Office has specifically addressed both: (1) a computer-readable media encoded with computer instructions, and (2) a computer-readable medium encoded with data structures. With respect to the latter, the Office states:

Data structures not claimed as embodied in computer-readable media are descriptive material per se and are not statutory because they are neither physical "things" nor statutory processes. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention which permit the data structure's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a data structure defines structural and functional interrelationships between the data structure and the medium which permit the data structure's functionality to be realized, and is thus statutory (emphasis added).[1]

The Office's analysis is primarily based on cases in which the Court of Appeals for the Federal Circuit (CAFC) has specifically considered claims to a computer-readable medium storing unique data structures. In particular, in *In re Lowry,* the CAFC expressly stated that data structures on a medium are specific electrical or magnetic structural elements. In the *In re Lowry* decision, the court noted that the data structures are physical entities that provide increased efficiency in computer operation, and enable more efficient data processing operations on stored data. The court concluded, therefore, that the data structures indeed "perform a function" and constitute patentable subject matter under 35 U.S.C. § 101. Consequently, the Lowry data structures indeed provide a useful, concrete and tangible result.

[1] Examination Guidelines for Computer-Related Inventions Final Version, § B(1)(a), pg. 9.

Applicant submits that claims 18-22 are directed to a computer-readable medium in which the interrelation between the data stored by the data structures as enables operation of a network router as claimed. As a result, the data structures of Applicant's claims provide a useful, concrete and tangible result. As expressly stated by the court in the *In re Lowry* decision, and as recognized by the Office's guidelines and the Examiner, such claims are directed to patentable subject matter under § 101. Applicant requests withdrawal of the rejection of claims 18-22 under 35 U.S.C. § 101.

Claim Rejection Under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 1-3 and 9 under 35 U.S.C. 102(b) as being anticipated by Coan et al. (US 5,093,824). Applicant respectfully traverses the rejection to the extent such rejection may be considered applicable to the amended claims. Coan et al. (Coan) fails to disclose each and every feature of the claimed invention, as required by 35 U.S.C. 102(b), and provides no teaching that would have suggested the desirability of modification to include such features.

For example, with respect to claim 1 as amended, Coan fails to teach or suggest communicating an update message to routers within a computer network in accordance with a routing protocol, wherein the update message request withdrawal of one or more routes through the computer network that rely upon the failed link, and wherein the update message further incorporates the link failure information to identify the failed link.

First, Coan does not describe "routers" as the term is used by the Applicant within the present application and generally known to one skilled in the art. More specifically, the term router, as used by the Applicant, refers to a network device that forwards individual data packets in accordance with routing information that defines a topology of a network and, in particular, routes (also referred to as paths) through the network. For clarification purposes, the Applicant refers the Examiner to pg. 1, ll. 15-20 of the present application that states:

> *Certain devices within the network referred to as routers maintain tables of routing information that describe routes through the network. A "route" can generally be defined as a path between two locations on the network. Upon receiving an incoming*

data packet, the router examines destination information within the packet to identify the destination for the packet. Based on the destination, the router forwards the packet in accordance with the routing table.

In contrast, Coan describes "reconfigurable digital cross-connect nodes" that include a digital cross-connect switch and a configuration table for controlling the interconnection of multiple fiber-optic links[2] More specifically, Coan states "the [Coan system] is a scheme for reconfiguring a physical network ... ."[3] Thus, the Coan is not describing "routers" as the term is used and defined by the Applicant.

Second, Coan does not teach or describe communicating an update message to routers within a computer network in accordance with a routing protocol, wherein the update message request withdrawal of one or more routes through the computer network that rely upon the failed link, as required by amended claim 1.

In reference to these elements, the Examiner states that Coan describes flooding "link failure messages" and an "UPDATE subroutine" of the Coan system for reconfiguring the node. However, in contrast to the Examiner's assertion, Coan does not describe an update message that withdraws routes. The term "route," as used by the Applicant within the present application and generally known to one skilled in the art, defines a path through a network. In other words, the route generally defines a path from a source to destination that may be separated by many intermediate nodes. Again, for purposes of clarification, the Applicant refers the examiner to pg. 7, ll. 6-9 of the present application that states:

In the event of a link failure, such as link 8, router 4D may broadcast an update message instructing neighboring autonomous systems to withdraw route {12D,12B} from their routing tables. This message causes neighboring autonomous systems to generate update messages, until router 4J eventually receives one or more update messages from each of neighboring autonomous system 12G, 12F and 12I over a period of time. For example, AS 12F may issue an update message withdrawing route {12F, 12D, 12B} (emphasis added).

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[2] See, e.g., Abstract and Background, ll. 13-39.
[3] Col. 4, ll.58-60.

This exemplary paragraph from the present application illustrates that the term "route" is defined and used by the Applicant to generally refer to a path from a source node to a destination node that may be separated by multiple intermediate nodes.

In the sections referenced by the Examiner, Coan states that:

> *[I]n order for the in order for the nodes to load the proper configuration tables when there is a failure event, the network is selectively flooded with messages so that all of the nodes are informed of the failure event and have a consistent view of the existing network topology which results from the failure event. All the nodes are then able to load appropriate configuration tables so that the network is reconfigured consistently.*[4]

Coan makes clear that, in the event of link failure, the reconfigurable switches of the Coan system output messages to communicate the link failure. The switches then load pre-computed tables to reconfigure the optical interconnections. Nowhere does Coan teach or suggest outputting a message that both: (1) specifies the withdrawal of routes, and (2) includes an identification of a failed link on which the routes rely, as required by claim 1, as amended. These are distinct requirements of Applicant's claim, and Coan merely describes sharing failed link information between fiber-optic switches.

As Coan describes reconfigurable switches (as opposed to routers) the Coan system is inapplicable to the elements of Applicant's claim 1 that require communicating an update message to routers within a computer network in accordance with a routing protocol, wherein the update message request withdrawal of one or more routes through the computer network that rely upon the failed link, and wherein the update message further incorporates the link failure information to identify the failed link.

Coan et al. fails to disclose each and every limitation set forth in claims 1 and 9. For at least these reasons, the Examiner has failed to establish a prima facie case for anticipation of Applicant's claims 1 and 9 under 35 U.S.C. 102(b). Withdrawal of this rejection is requested.

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[4] Col. 6, ll. 27-34.

Claim Rejection Under 35 U.S.C. § 103

Claims 4, 7-8, 10-12, 23-24, 26-30 and 37-38

In the Office Action, the Examiner rejected claims 4, 7-8, 10-12, 23-24, 26-30 and 37-38 under 35 U.S.C. 103(a) as being unpatentable over Coan et al. (U.S. 5,093,824) in view of Agarwal et al. (U.S. 6,760,777). Applicant respectfully traverses the rejection. The applied references fail to disclose or suggest the inventions defined by Applicant's claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed invention.

As one example, with respect to independent claims 10 and 23, Coan and Agarwal fail to teach or suggest forwarding a packet according to a path vector routing protocol using the link failure information. With respect to claim 11, Coan and Agarwal fail to teach or suggest routing the packet according to the Border Gateway Protocol (BGP). Similarly, with respect to claims 4, Coan and Agarwal fail to teach or suggest generating the update message to conform to the Border Gateway Protocol (BGP).

In rejecting these claims, the Examiner proposes to modify the Coan system with the multi-processor router described by Agarawal et al. (Agarawal). In particular, the Examiner asserts it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the reconfigurable digital switches of the Coan system to use a path-vector routing protocol, such as the Border Gateway Protocol. Applicant respectfully traverses these rejections.

As described in detail above, Coan describes digitally reconfigurable "switches" capable of dynamically changing fiber optic interconnections. The switches maintain configuration tables that show the "pattern of cross connections" at a given node.[5] Coan states that a configuration table for a node shows "how the physical links incident [to that node] are interconnected."[6] Each line of a configuration table "represents a connection between a channel of one physical link and a channel of another physical link."[7]

[5] Coan at col. 4, ln. 2.
[6] Id at col. 4, ll. 27-28.
[7] Id at col. 4, ll. 36-37.

In other words, the switches of the Coan system maintain information related to the status of individual links, and not to routes through a network. As illustrated through the description and figures of Coan, the switches within the Coan system are unaware of the other switches within the network. Rather, the individual switches solely controls the interconnection of the fiber-optic links to which it is coupled. FIG. 4 of Coan, for example, clearly shows the configuration tables for nodes A-D. As the nodes of the Coan system are "switches" and not "routers," the tables for any given switch lists information for the links coupled to that particular switch. Thus, it is clear that the switches within the Coan system do not maintain information describing routes, and it is incorrect to suggest that the Coan system could somehow by modified to incorporate a path-vector routing protocol for selecting routes to destinations within a network.

Consequently, the Examiner is in error in asserting that it would be obvious to one of ordinary skill in the art to modify the reconfigurable digital switches of Coan in view of Agarawal to utilize the Border Gateway Routing protocol. The fiber-optic switches of the Coan system maintain information related to specific links to which they are connected and simply could not employ a path-vector routing protocol, such as BGP, to withdrawal routes and convey link failure information, as required by claims 4 and 7. Neither Coan nor Agarawl, either singularly or in combination, teach or suggest the use of a routing protocol to convey both withdrawn routes and link failure information identifying a failed link.

Similarly, with respect to claims 8, the Examiner is in incorrect in asserting that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the reconfigurable digital switches of the Coan system in view of Agarawal to route data packets according to the Border Gateway Protocol. As Coan describes "switches" capable of reconfiguring fiber-optic links, the switches are simply incapable of executing a path-vector routing protocol to route individual data packets. In fact the switches make no "routing" decisions for individual packets at all. Rather, the switches reconfigure fiber-optic links in the event of a failure.

With respect to claims 12, 24 and 30, neither Coan nor Agarawal teach or suggest selecting a route based on a routing table, wherein the route defines a path to the destination; and discarding the route when the path uses the failed link. Further, neither Coan nor Agarawal teaches or suggests a system having a data store holding link failure information identifying

failed links, a routing table to store routing information, and a control unit to forward packets based on both the link failure information and the routing information from the routing table, as required by claim independent claim 27.

The Examiner refers to Coan as describing nodes that maintain a routing table and selecting a route for a packet based on a routing (configuration) table. This is incorrect. As described above, the digital switches of the Coan system do not select routes for individual packets. To the contrary, the digital switches store configuration tables that control the manner in which fiber-object links are connected through the respective switch. Coan makes clear that the tables that show the "pattern of cross connections" at a given node.[8] Coan states that the configuration tables show "how the physical links incident [to a node] are interconnected." [9] Each line of a configuration table "represents a connection between a channel of one physical link and a channel of another physical link."[10]

Consequently, in no manner does Coan describe selecting a route from a routing table, wherein the route defines a path through a network, as required by Applicant's claims. The Examiner is incorrect in asserting that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the reconfigurable digital switches of the Coan system select a route from a routing table and then discard the route when the route defines a path that uses the failed link, as further required by Applicant's claims.

Claims 5-6, 13, 15, 25 and 31-33

The Examiner rejected claims 5-6 under 35 U.S.C. 103(a) as being unpatentable over Coan et al. in view of D'Souza (U.S. 6,173,324), and rejected claims 13, 15, 25 and 31-33 under 35 U.S.C. 103(a) as being unpatentable over Coan in view of Agarwal et al. in further view of D'Souza.

In rejecting claims 5-6, the Examiner asserts that Coan teaches a time period for storing the link failure information, as recited in claim 5, and a time period for using the link failure

[8] Coan at col. 4, ln. 2.
[9] Id at col. 4, ll. 27-28.
[10] Id at col. 4, ll. 36-37.

information to control routing decisions, as recited by claim 6. According to the Examiner, Coan merely fails to teach *generating* the time periods. Applicant respectfully traverses the rejection.

The Examiner states that "the failure information stored in the configuration table between the executions of the procedure can be defined as 'time period' or intervals between the for-loop of the protocol execution." Although the Examiner is likely correct that each iteration of the software loop described by Coan takes a finite amount of time, this execution time is not related to a defined time period during which the link failure information is utilized and then, upon expiration of the time period, disregarded.

In fact, quite contrary to the Examiner's assertion, the digital switches of the Coan system reconfigure only when a failure or other link status change is detected. If no change is detected, the configuration tables are not updated. Thus, Coan cannot be construed as defining any form of finite time period that expires. D'Souza merely describes executing a network monitor and adds nothing to overcome the deficiencies of Coan. Neither Coan nor D'Souza teaches or suggests generating data defining a time period for storing the link failure information, and automatically deleting the link failure information upon expiration of the time period, as required by amended claim 5. Similarly, neither Coan nor D'Souza teaches or suggests generating data defining a time period for using the link failure information to control routing decisions, and automatically routing packets as if the failed link has been restored upon expiration of the time period, as required by amended claim 6.

In regard to claim 15, none of the cited references teach or suggest storing the link failure information for a storage time period, and selectively forwarding additionally received copies of the link failure information based on the expiration of the storage time period. First, as described above, the Examiner is incorrect in asserting that the software loop described in Coan define a time period for storing the link failure information. As explained above, the digital switches of the Coan system reconfigure only when a failure or other link status change is detected. No time period is "defined," and the switches of the Coan system may utilize the link failure information indefinitely until another event is detected. Second, none of the reference teach or suggest selectively forwarding copies of the link failure information based on the expiration of the storage period. To the contrary, Coan teaches flooding link failure messages at one time. Agarwal merely describes forwarding routing messages, and does not describe selectively

forwarding routing messages at all. D'Souza merely describes executing a network monitor. Thus, none of these references make any suggestion of selectively forwarding link failure information based on a defined time period for storing the link failure information, as required by Applicant's claim 15.

Claims 16-17 and 34-36

In the Office Action, the Examiner rejected claims under 35 U.S.C. 103(a) 16-17 and 34-36 as being unpatentable over Coan in view of Agarwal in further view of Hardjono (U.S. 6,425,004). Applicant respectfully traverses the rejection. Claims 16-17 and 34-36 are allowable for at least the reasons set forth above with respect to the base claims on which they depend. Moreover, the applied references fail to disclose or suggest authenticating link failure information, as required by claim 16. Hardjono appears to describe authentication a source of a packet generally, but makes no mention of authenticating a source of link failure information.

For at least these reasons, the Examiner has failed to establish a prima facie case for non-patentability of Applicant's claims 4-38 under 35 U.S.C. 103(a). Withdrawal of this rejection is requested.

New Claims:

Applicant has added claims 39-44 to the pending application. The applied references fail to disclose or suggest the inventions defined by Applicant's new claims, and provide no teaching that would have suggested the desirability of modification to arrive at the claimed inventions.

As one example, the references fail to disclose or suggest a method comprising: receiving a message including link failure information identifying a failed link within a computer network, wherein the link failure information defines a storage time period for which the link failure information is to be stored by the receiving router; storing the link failure information in accordance with the storage time period; and selectively forwarding subsequently received messages that include the link failure information based on the expiration of the storage time period, as recited by claim 39.

As another example, the references fail to disclose a method comprising: receiving a message including link failure information identifying a failed link within a computer network,

wherein the message includes an origin identifier that identifies an originating network device that detected the link failure and a timestamp indicating when the failed link was detected; accessing a data store to determine whether link failure information identifying the same failed link, originating network device and timestamp has previously been received; and forwarding the message only when the link failure information has not been previously received, as required by claim 42.

No new matter has been added by the new claims. Support for the new claims can be found throughout the present application and the originally filed claims.

Allowable Subject Matter

In the Office Action, the Examiner objected to claims 14 as including subject matter that would be allowable if rewritten in independent form. In this amendment, Applicant added new independent claim 44 that includes all subject matter recited by claim 14 and the base claim and any intervening claims on which claim 14 depends. Consequently, claim 44 is in a condition for allowance.

CONCLUSION

All claims in this application are in condition for allowance. Applicant respectfully requests reconsideration and prompt allowance of all pending claims. Please charge any additional fees or credit any overpayment to deposit account number 50-1778. The Examiner is invited to telephone the below-signed attorney to discuss this application.

Date: December 20, 2004

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AMENDMENTS TO THE DRAWINGS

In the Office Action, the Examiner objected to Figures 1-2 and 7-8. In particular, the Examiner stated that the figures should be labeled with "descriptive legends" based on 37 C.F.R. § 1.84(o).

As a preliminary matter, Applicant respectfully points out that 37 C.F.R. § 1.84(o) states that drawings "may" be labeled with legends. In other words, legends are optional. Secondly, it appears that the Examiner is referring to the "blocks" illustrated by the figures. Consequently, the Applicant assumes the Examiner is requesting the Applicant add descriptive labels to the individual blocks and not "legends" which generally are titles applied to each drawing as a whole. Applicant points out that the Examiner's reliance on 37 C.F.R. § 1.84(o) is likely incorrect.

Nevertheless, Applicant submits herewith replacement drawing sheets for FIG. 1-2 and 7-8 for the present application. In the replacement sheets, Applicant has added descriptive labels for purposes of clarity. For example, in FIG. 1, Applicant has added the label "ROUTER" to routers 4A-4D. In FIG. 2, Applicant has added the label "A.S." to each autonomous system 12A-12J. In FIG. 7, Applicant has added the label "A.S." to each autonomous system 12A-12J and the label "CONFEDERATION" to each confederation 72A-72C. In FIG. 8, Applicant has added the label "A.S." to each autonomous system 12A-12D.

The added labels are consistent with the corresponding description throughout the present application. No new matter has been added by way of this amendment.